

# **WDM Technologies on Military Platforms:**

**Where are we going and  
how should we get there?**

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Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE <b>18 APR 2000</b>		2. REPORT TYPE <b>N/A</b>		3. DATES COVERED <b>-</b>	
4. TITLE AND SUBTITLE <b>WDM technologies on military platforms: Where are we going and how should we get there?</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Lockheed-Martin Aeronautics Co.</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release, distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>DARPA/MTO, WDM for Military Platforms Workshop held in McLean, VA on April 18-19, 2000, The original document contains color images.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>UU</b>	18. NUMBER OF PAGES <b>11</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

# ***Topics of Discussion***

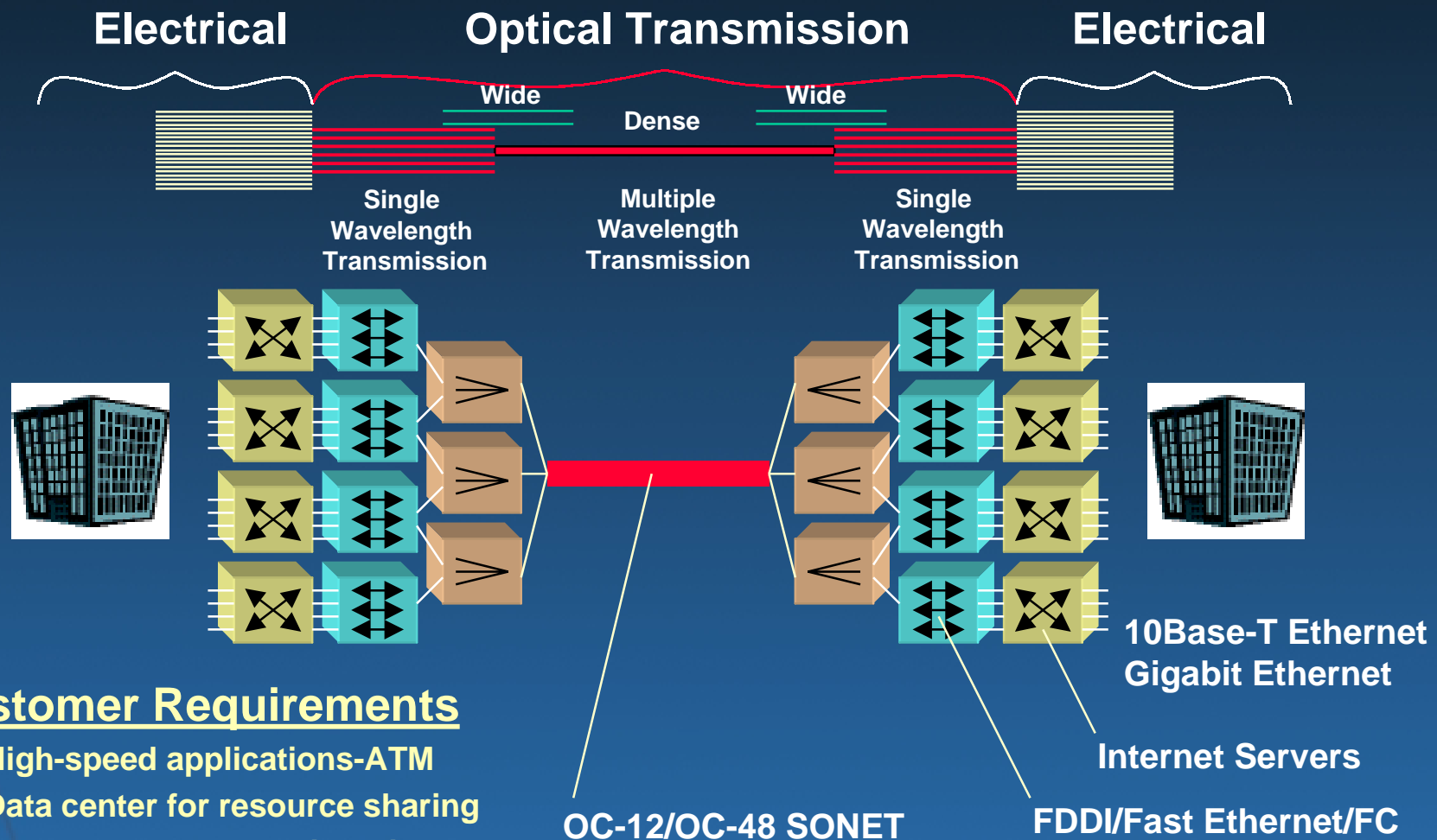
- **Technology availability, maturation, and development**
- **LM Vision of the future (military operational capabilities and platform missions)**
- **Standardization/Inter-Operability**

# ***WDM on Military Platforms***



**Multiple programs will and are benefiting from  
WDM technology development**

# Commercial Market and Products

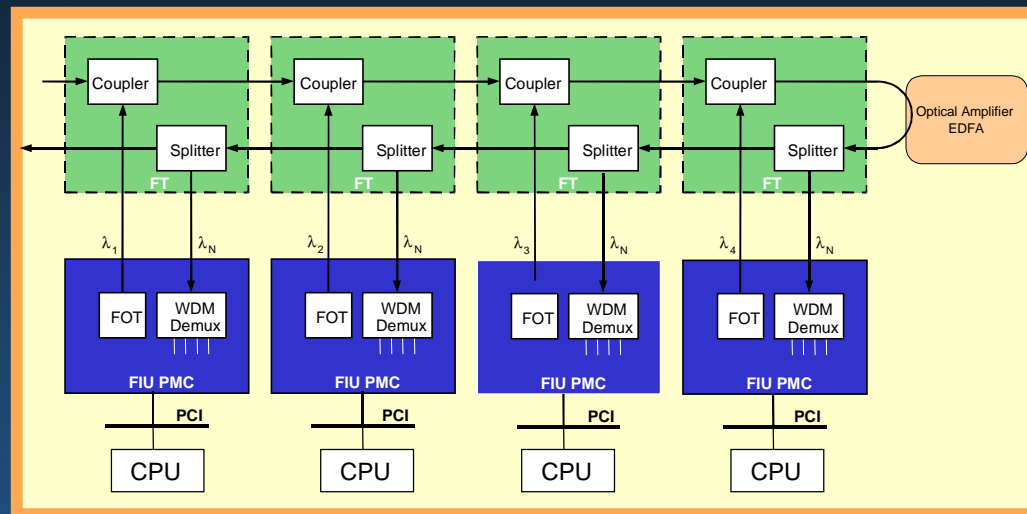


## Customer Requirements

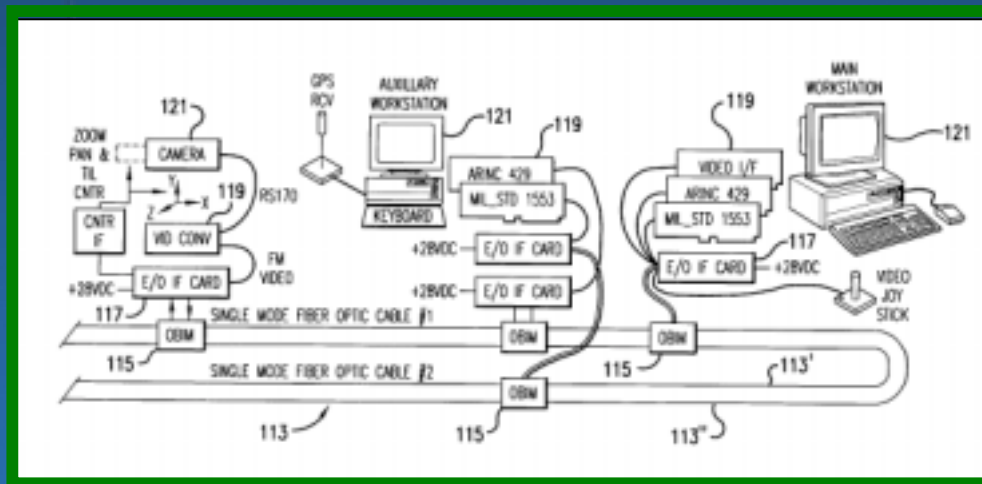
- High-speed applications-ATM
- Data center for resource sharing
- Storage area networking-Fibre Channel
- LAN backbones
- Video and others

# Current LM Military Demonstrations

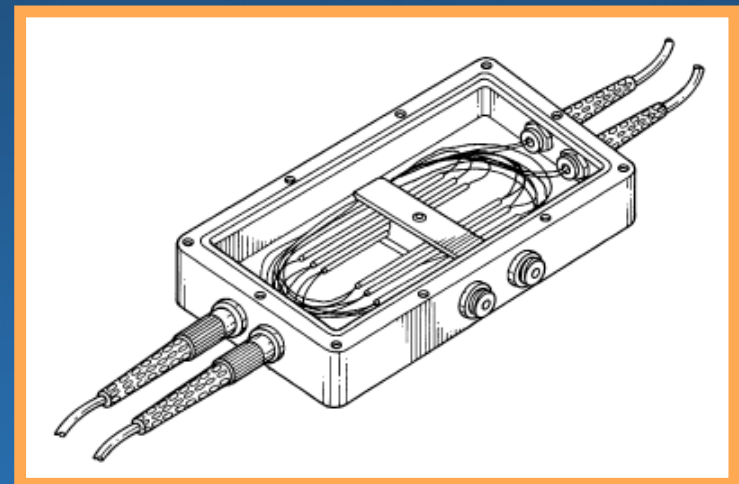
## FAST Avionics Bus Demonstration



## FOBWDM™ Demonstration



## Example of Bus Interface



US Patents 5,898,801 & 5,901,260

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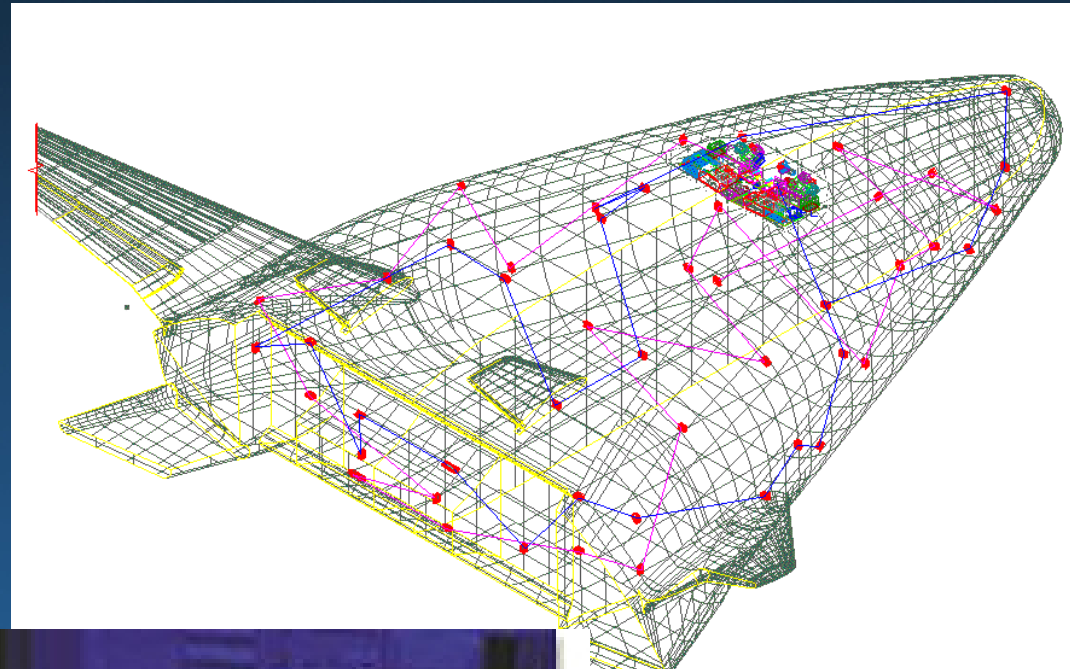
# *Future Uses of WDM in Air and Space*

## VMS and Health Management

- Sensors
- Data Links
- Pilot Interface

## Avionics

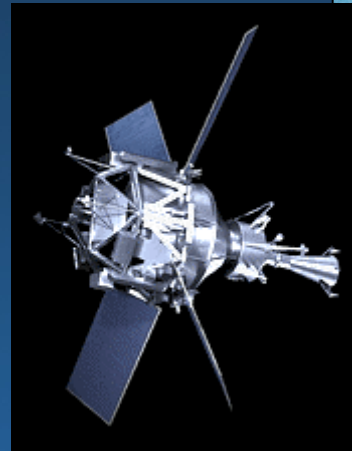
- Sensors
- Communication Links
- Phased Array Antennas



# *Naval & Satellite Uses for WDM*

## Naval

- Ship Board Systems
- Communications
- Sensors
- Towed Arrays



## Satellite

- Signal Distribution
- Phased array beamformers
- Processing





# ***Standardization & Inter-Operability Issues***

## **International Telecommunications Union (ITU):**

- ! Point-to-point systems are deployed in “open” architectures**
- ! “Grid” specifies a 1,550 wavelength band at 100GHz frequency spacing**
- ! Industry products conform to the grid therefore elements are standardized/interoperable**

## **Commercial WDM Solution:**

- ! WDM is a proven method for low-cost increased bandwidth**
- ! Increasing bandwidth by a factor of 30, with 50% cost reduction**
- ! Large volumes of point-to-point WDM systems have been deployed to increase capacity of existing fiber cable plants**

## Optical Transmission Formats:

### *Single Wavelength Transmission*

<b># Serialized Data Streams</b>	<b>1 per wavelength</b>
<b>Multimode Fiber Availability</b>	<b>Yes</b>
<b>Singlemode Fiber Availability</b>	<b>Yes</b>
<b>COTS Components</b>	<b>850nm, 1300nm, 1550nm</b>
<b>Cost Target</b>	<b>\$100 per transceiver</b>

# Optical Transmission Formats:

## *Multiple Wavelength Transmission*

	<b>Wavelength Division Multiplexing</b>	<b>Dense Wavelength Division Multiplexing</b>
<b># Serialized Data Streams</b>	<b>2 to 8</b>	<b>8 to 128</b>
<b>Multimode Fiber Availability</b>	<b>Yes</b>	<b>No</b>
<b>Singlemode Fiber Availability</b>	<b>Yes</b>	<b>Yes</b>
<b>COTS Components</b>	<b>850nm, 1300nm, 1550nm</b>	<b>1550nm</b>
<b>Comment</b>	<b>Wide wavelength separation increases system reliability</b>	<b>Small wavelength separation requires precision laser temperature control</b>
<b>Cost Target</b>	<b>&lt;\$200 per multichannel transceiver</b>	<b>\$1K per multichannel transceiver</b>

# ***How Do We Get There***

- **Transition COTS Components into Military Environments**
- **Demonstrate WDM Components Enabling WDM Technologies on Military Platform**
- **Continue and Expand Research Efforts**
- **Transition LM Research into COTS products**